

The Universal Robot - Vincent Wray

I currently use technology in every subject area. From my ninth grade earth science classes where we make maps using some handheld GPS units to soil testing using the latest technology of nuclear reactors to detect trace metal contents. In this class this year we will collect soil samples from our area and request another 50 samples from other high schools in Idaho. These samples will be sent to Ohio State University to be tested for trace metal content. At the University they will be placed in the nuclear reactor and irradiated. After irradiation the samples can be placed in a spectrophotometer where the trace metal amounts can be read of certain trace elements. This project is in connection with the NRCS (National Resource and Conservation Service) and the state of Idaho. They currently do not have this data on soils in Idaho and are excited that we are going to be able to do this. Following the testing the students will design a web site to display this information for all to use and hopefully get other schools involved in following years to test soils in their areas. I have also taught anatomy and physiology classes this year where we used nuclear reactors to time-date milk jug type plastic that was left at a crime scene. The reactor is using a new technique to mimic the sun's radiation or DNA technology called PCR (Poly-Chromial Replication) is used to identify DNA.

I also use the latest in robotics and computer programming in my agricultural classes to design robots to perform specific agricultural tasks. I currently have a robotics club meeting after school to work on building the robots for these tasks along with learning to use animation and programming software. We use software such as Auto CAD, and 3D Studio Max to draft and refine the drawings of the robots. The ultimate goal of the class and after school group is to design, build and program a robot to enter a national high school robotics competition this spring.

Throughout my teaching career I have tried every conceivable avenue for using technology to inspire the students and enhance my classroom approach. Twelve years ago I started the Shelley Solutions Science program. Over the years this program was a technology and science based program using real world problems to motivate students to go above and beyond. In this program students were encouraged to find technologies to solve local problems. One such project was The Potato Processing Plant Warm Water Exchange. Students had an idea to use the hot wastewater from a local potato processing plant that was two blocks from the school to aid in heating the school. One of the issues was to locate and investigate an old abandoned underground pipe to transport the hot water from the plant to the school. The students contacted a local firm to adapt a robot with a camera to do the investigation. They used 3-D modeling and drafting software along with GPS to map the location and condition of the pipe. At the time it was not common for high school students to use this sophisticated software. Of the eleven students who worked on the project, two were minority and four were young females. All of them went on to college and earned degrees in technical fields.

For many years I have been in charge of a summer program at the INL to bring students and teachers together with mentors for internships. As part of this summer experience I teach a college course for the students and one for the teachers. The basis for these classes has always been the use of technology. I started years ago getting the students up to speed on software packages such as databases, Excel spreadsheets, Power Point and many others making sure the student had the highest level of skill. In recent years we focus more on animation and communication software along with programming since most students come in knowing most PC software. This program has been awarded with accolades and financial support because of the students' high level of skill following an experience with us. Many of the hundreds of students over the last few years have been accepted into prestigious programs throughout the country.

Our current solutions projects are striving for the highest level of skill as well. I currently have students who are working with a graduate student in engineering on building some robots. They are using the latest 3-D animation and drafting software along with learning C++ programming to

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accomplish this task. These students are not all A students who have always been headed to college. Some of the students have been lower on the academic scale and are now so excited about technology they go home and spend many of their own hours working on the programming and software. Some are now headed to college who were not planning to go before. Like wise as they go to take their ISAT tests in math and science they can see a relevance to their learning. Also will do better on the test.

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In our small rural school we are not able to offer courses in engineering, computer programming, computer aided drafting and robotics. However, some students are still interested in them. I believe the level of interest would be increased if students had an experience in these areas. If we want more students to be scientists, engineers, mathematicians, and technologists we need to give them an experience early in their academic lives. I have looked for a way in my solutions curriculum to fill these needs. As I looked I found the G K-12 project and grant from Idaho State University which would send an expert to my classroom ten hours per week. This expert would be a graduate student in Electrical Engineering. He has the expertise to teach the students and myself about computer programming, engineering design, computer animation, electric motors and control. He brings with him the support of the entire college engineering dept. that can help us in the area of robotics. He also helped us get into a robotics competition which we entered to make the learning relative to the students every day knowledge and experience. Each time we take another step the students benefit a great deal more. Now all we need is the equipment and supplies to take that next step to build the actual working robots. I found a grant to buy the initial robotic kits. However they were short the advanced parts and programming items needed to take the learning to the highest level. These items are being requested in this proposal.

As we built the beginning robots it has been great to see how much involvement students have had in their own learning. The areas previously mentioned were now in their grasp. They are beginning to learn some C programming and computer animation. With these advanced parts we will be able to take the every day computer and some every day agricultural tasks and make them come alive in new hands on ways. The students will actually be programming the robots rather than just reading about what some student somewhere has done. They are not just enhancing knowledge and technical skills but are learning the important life skills of team work, compromising skills, communication skills (both verbal and through technology), the art of fundraising, budgeting and thrift, the responsibility to do a job right and the skill of hard work. All of these skills will make them better voting citizens and adults. These are the skills of highly successful people.

Currently, I have secured a grant to purchase some Lego robot kits and three more advanced kits called Vex Robot kits. The Lego's are a great place to begin the learning process and they operate with a very basic programming language, but I would like to get more advanced and so would the students. The Vex kits allow us to do this but we need more kits and more advanced parts. With over twenty students in class and another eighteen in the after school program three kits are just not enough. It is proven that students make career and higher education decisions on the experiences they have had in school or at home or at work.

The kits are missing the programming chips to make them programmable in C++ language. They also lack the air-operated components, which allow the students to have gripping hands and moveable arms. These items will allow us to go beyond the toy stage of the Legos and into the real learning of engineering and math. They will allow those students to learn real programming, which they cannot get in any other class in our school.

One of the innovative pieces of this class is the support from Idaho State University. The support they give is the funding for a graduate student in engineering to come to my classroom to help teach the programming and robotic design. He has been a great help and a great mentor to the students. They have been able to get so much from his being there. He has help get the students interested in an after school club, when they couldn't be in the regular class during school hours. His knowledge and excitement about engineering has already motivated some students to begin learning programming on their own time. Our only problem has been not having any equipment to work with.

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As the students work with these kits, their minds open up to all kinds of possibilities. The creative thought and motivation which comes from taking a task that must be performed and designing and building a machine all on their own to do that task is so exciting for them and for me.

The items purchased will be used to enhance the interaction the students can have with the graduate student and will help us go to the robotics competition this spring and continue our learning in a new experience. The students will be doing college level work and increasing their exposure to real hands on research and design on the robots. Many lab based programs and/or classes give their students hands on experiences, but few give them the avenue to use the knowledge learned in a real life setting. Without the teacher there at every turn as guide these students will be on their own to accomplish this task. These students and many more to come in the future years will look on this experience as the start of their science, math, technology, or engineering career.

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**Qwest Foundation for Education Grant Expenditure Plan
(Standard IFARMS Budget Format)**

Activity	100	200	300	400	500	TOTAL
	Salaries	Benefits	Contractual Agreements	Materials and Supplies	Capital Objects	
4 Vex robot kits				\$300.00 ea.		\$1200.00
5 programming chips				\$100.00 ea.		\$500.00
3 radio crystal sets				\$75.00 ea.		\$225.00
4 battery packs				\$50.00 ea.		\$200.00
3 single air lift rams				\$180.00 ea.		\$540.00
1 double air lift rams				\$300.00		\$300.00
spare wheels and misc. parts				\$350.00		\$350.00
3 air compressors				\$250.00 ea.		\$750.00
TOTAL				\$4065.00		\$4065.00